IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

Hypertext Design and Working Methodology

R. N. Jugele[*1], Dr. V. N. Chavan[2]

[*1]Department of Computer Science, Science College, Congress Nagar, Nagpur. Maharashtra, India

[2]Department of Computer Science, S. K. Porwal College, Kamptee, Maharashtra, India

rn_jugele@yahoo.com

Abstract

Hypertext systems are easier to write today, computers are much faster, languages and libraries are greatly enhanced, under standing of software architecture, design and development have all improved dramatically. While documents are accessed the implicit hypertext structure of the original documents should be employed. Different hypertext structures and methods for analyzing paper documents to structures are presented. The structures also form the basis for the presentation of the content of the document to the user.

Documentation are stored in text files that generally flat i.e. linear way and this organization is not adequate. The documentation of a software system are interleaved with the source code and have many possible paths to read the available information. A hypertext enables non-sequential reading and writing which consists of set of nodes where each node contains some amount of information. These nodes are connected by links and form a directed graph.

Keywords: Spatial, schemas, link, reference, integrity, hypertext

Introduction

Navigating a hypertext means following these links, each node have several outgoing links and there are many possible sequences which inspect the nodes. This gives the user the feeling of free movement through the available information[21] [15].

The ideas of hypertext was describe by Vannevar Bush[2], vision of organizing information similar to the human mind, which operates by association describe in memex. Bush's ideas influenced the work of Douglas Engelbart, who developed NLS (oN Line System). It was an experimental tool for storing specifications, plans, designs, programs and documentation and for doing planning, designing, debugging[9]. More and more hypertext systems have emerged with the evolution of cheaper and more powerful computers[6][20]. Possible applications of hypertext systems include dictionaries, encyclopedias, product catalogs, technical documentation, help systems and software engineering tools. Hypertext tools are the new generation of documentation tools. Nonsequential reading and writing is extremely useful for software documentation and the concepts of hypertext used for the integration of source code and documentation.

The documentation organized with hypertext tools are easier for users to explore software systems and good quality document can more easily be studied and checked for consistency and completeness.

Hypertext gives the idea, design decisions and connect them with the corresponding source code locations without the need to create separate documents. Ideas and design decisions were written down during the development phase is easier and less tedious than writing documentation from scratch after development. The fact that software systems change during development becomes less serious because the corresponding documentation parts are easily available and kept consistent.

Nodes and links in a hypertext documentation are well structured, this is major factor that determines how easily it is used and update. Additional features like indexes, searches, filters, bookmarks and path histories enhance the opportunities of hypertext. Arbitrary nodes and links can be defined when writing a hypertext and there exist numerous possible ways through a hypertext when reading it, so predefined structures and guidelines help in producing documentation and minimizing the danger of getting lost in a complex information web.

Spatial Hypertext

Spatial interface indicates four major benefits:

- It takes advantage of people's considerable visual recognition and intelligence

- It facilitates constructive ambiguity
- It supports emerging problem-solving strategies
- It reduces overhead in communicating with others

It allow users to take advantage of their visual memory and pattern recognition. Remembering where one saw a document in a visual workspace is a process of recognizing the area in which a document was located at a progressively finer-grained level. It facilitate for constructive ambiguity, where a link in a document-centered hypertext either exists or does not in a particular presentation of the material, placement of a node close but not quite with others can imply some indecision or potential for a relation between the nodes. Allowing people to express ambiguity more easily and enable to perform tasks such as analysis or design interpretations work with the materials.

Many tasks require information to be shared among a group of collaborators. Hypertext's application to information sharing has been investigated by many systems including the Virtual Notebook System[19] and Sepia[22]. The initial study of spatial layouts of information implied a correlation between the number of people sharing information space and the degree of visual structure apparent in the arrangement. When it was necessary for more people to understand the information space, they created a higher degree of perceptual structure and followed it more strictly. As with sharing information in a navigational hypertext or file system, users must agree on a basic framework in order to effectively communicate. In contrast with a navigational hypertext or file system, effective use of ambiguous and implicit relationships does not require on users to agree on particular relationships or agree on their interpretation.

Link Navigation/Retrieval

Information Retrieval and the Hypermedia approach communities are converging in the search for powerful multimedia information management tools. The Information Retrieval community is particularly concerned with retrieval. Retrieval typically answers the request "find documents containing something like this query". In terms of links or associations, retrieval usually relies on being able to make an association between a query, for example a keyword or phrase and an information item (document) containing something similar to the query. Typically, the association is achieved either through pre-indexing analysis.

The Hypertext community has been particularly concerned with navigation. Navigation involves steering across links or associations which do not necessarily require similarity between the source and the destination. The link may represent some meaningful higher level association that is typically identified through the mind of the link author.

Retrieval and navigation can result in the dynamic provision of links created on the fly using theming technology based on statistical and linguistic techniques to provide links derived from the current document context. This technology has been successfully employed commercially[12] as an evolution of a dynamic link service[3][4].

Hypertext Model

Main concept of model is the HTML page and the URI (uniform resource identifier). The hypertext model has different types of links i.e. reference, inclusion and link behaviors. The content of a node is a tree of elements.

Generally a hypertext model structural part is composed of nodes, anchors and links. Each node has a unique identity and a content. The content of a node is a sequence of elements which may be character strings, images, etc. An anchor is an element or a sequence of elements within the content of a node, it serves as a starting or ending point of a link. A link is defined by its starting and ending anchors and by its category it is either ‘reference’ or ‘inclusion’. Reference links are intended to create a navigation structure within the nodes. Inclusion links are intended to create nested structures that represent complex contents[16].

This model can easily be mapped only problem comes from inclusion links because in HTML, the <A HREF...> tag corresponds to reference links and there are no inclusion links (except for images, with the IMG tag). The approach creating tools for the Web was to represent in a single HTML page, the content of a node, all its subnodes and use embedded list tags to show the inclusion structure.

Reference links

It creates an active element whose action consists of jumping to the referred link. A link specification refers to a node through its identity, which is composed of its schema name together with actual parameter values. The source anchor of a link can be any element or list of elements. A reference link is specified with the following syntax :

href ***node_schema_name*****[** ***actual_parameter_list*** **] (** ***element, ...*** **)**

Inclusion links:

It creates a compound-component relationship between two nodes. The content of the included node is a part of the content of the parent node and can themselves include other nodes, it is

possible to create complex hierarchical documents through inclusions[14]. This mechanism is very powerful and serve many purposes such as:

- computing outer-joins
- constructing complex hierarchical contents
- reusing node schemas
- computing paths in a graph
- computing transitive closures

Expand in place links

It is an inclusion link that defers the inclusion until the user activates the link. The content of a node with expand-in-place links are depend on user actions taken. For instance :

Expand href Work_image[wno]("[open image]")

It display the content of the Work_image instance corresponding to that work number.

Design Methodologies of Structured hypertext

It consist of successive steps:

- Conceptual design :It is similar to database conceptual design to capture the domain semantics and produces a conceptual model which can be a class diagram in OOHDM[17] or an entity relationship diagram in RMM[11]. Design can be supported by a hypertext system.
- Navigational design : It determines what information will be presented to users in the hypertext's nodes and how these nodes will be interrelated through hypertext links.
- Abstract interface design : It define all the necessary types of hypertext nodes and an efficient linking structure on these node types. A node type is specified by the type of entities it will present, some selection predicate and a list of attributes to include in the node content.
- Interface implementation : It defines what access primitives interconnect the nodes. Access primitives may be unidirectional, bidirectional links, groups of links, indexes and guided tours.

A rigid structure is promoted for its efficiency and cost-effectiveness but excessive rigidity can be costly.

Hypertext Design

It is a complex problem that has generated a lot of research[18]:

- To the identification of design issues
- The study of the design process
- The definition of design methodologies and principles
- The definition of design patterns
- The development of hypertext design environment

Hypertext design techniques have following questions: How

- To orient the readers and help them read efficiently with pleasure
- One help the readers retrace the steps in their reading path
- One inform those reading a document where the links in that document lead
- One assist readers who have just entered a new document to feel at home here

Hypertext orientation and access structures includes to address these questions:

- Indexes
- folder hierarchies
- navigation histories
- site maps
- home pages

The design process shows that designers act incrementally and have an opportunistic behaviour, reasoning at the abstract level and at the instance level[13]. Thus it is necessary to hypertext designers to take prototyping tools for the experimental feedback.

Hypertext Design Views

Schemas and instances of node

The hypertext view specification consists of node schemas and node types. Every node schema specifies :

- The data collections
- The selection and ordering criteria
- The elements that form the node content
- Links to other nodes

It has following form:

node *node_name* [*parameter_list*]
element_list
from *collection, ...*
selected by *boolean_expression*
ordered by *numeric_expression*

The content of a node is specified by a list of content elements. An element is either a compound element of the form < *element_type* > (*element,.....*) or a simple expression based on litteral constants, database attributes, functions and operators. Element types are tag names which depends on the target language.

Hypertext view consists of instances of schema views. Node is determined by its schema name and a list of parameter values. Content are obtained by querying the database according to the selection condition and finally evaluate the content elements on the selected tuples.

It is necessary to apply hypertext design principles to obtain efficient hypertext views.

The design method has two phases.

i. **Initial structured phase :** Structured hypertext design methodologies such as RMM[11] and HDM [1]. It takes the database schema as a starting point.

Hypertext structure schema

It made up of one node schema for each database relation. For a relation schema **R**(A1, …, Ar) with primary key attributes K1, …, Kn , the corresponding node schema is

node R[p1….. pn]
{A1….Ak}
from R selected by K1= p1….Kn = pn

If a group of attributes F1…..Fm forms a foreign key of another relation **S**, R must contain a reference link href S[F1…..Fm] (…). Instance of this schema represents a tuple of **R** with links pointing to tuples related through a foreign key.

Links and index reverse nodes

It is necessary to define index nodes to implement the 1 to n direction of an association based on a foreign key. If relation **R** has a foreign key F that refers to **S**, the index node is defined as follows:

node R_by_F [f]
{href R[K] (…)}
from R selected by F = f

K is a key of **R**. The node schema corresponding to S must be completed with a link of the form href R_by_F[L](…)

L is a key of **S**.

If two tuples t1 and t2 are related in the database through foreign keys, there exists some path in the hypertext to go from the representation of t1 to the representation of t2 and vice versa.

Entry points

It is intended to help the user enter the hyperspace or to reorient user during the navigation.

ii. **Refinement phase :** It consists of various refinement operations to incrementally enhance the hyperspace based on experimental feedback obtained by rapidly developing prototypes and testing them to improve the navigability of the hypertext view. The idea is to produce a new prototype by applying one or more operations to test it and collect the experimental feedback to incorporate it in the next prototyping cycle.

Link composition

To reduce the number of navigation steps in the hypertext view is to create "shortcut" links which consist of composing two or more links into a new one. When two nodes are defined on the same relation R this operation is straightforward. If a node N1 has a reference link to a node N2 and N2 has a link to a node N3, this last link can be directly incorporated in N1.

node R_from _X [...]
... href R[K]
from R...

where K is a key of R, in this case any link in R can be incorporated into R_from_X to suppress a navigation step. If the two nodes N1 and N2 are defined on different relation then the definition of N1 must be changed before incorporating a link of N2 into N1.

Inclusions

It consists of changing the nature of a reference link into an inclusion link. This operation is particularly interesting when the link has a semantics of the type "part-of "or "compound-of". It is also a way of reducing the number of reference links in the hypertext and thus to shorten navigation paths.

Summarization

When a node represents a large object with many attributes then it is desirable to derive "summarized" node by removing certain attributes of the initial definition. It has a link towards the complete node. It is also decided for each link which leads to the initial node if it is necessary to "redirect" it towards the summarized node.

Computed links addition

Some relationships are not represented directly in the database schema. Links corresponding to such derived relationships is created in the hypertext schema using diverse schemas.

Widening

It weakening its selection condition, other objects will be shown in the node. This is a way to contextualize information by presenting it together with related information.

Previewing

It is useful to see part of the contents of a referred node without having to traverse the link. This operation consists of creating a summarized node as in the derivation operation and complement the initial reference link with the inclusion of the summarized node.

The concept of active view

A fully functional hypertextual interface should enable the user to act on database through the hypertext view. It means

- Typical hypertextual operations like modifying a node contents, linking and unlinking nodes should be available
- It should be possible to trigger database procedures by acting on some hypertext object

Views are computed, the only way to update a view is to update the database and then recomputed the view include translate any view update operations into database update operations as shown in figure 1.

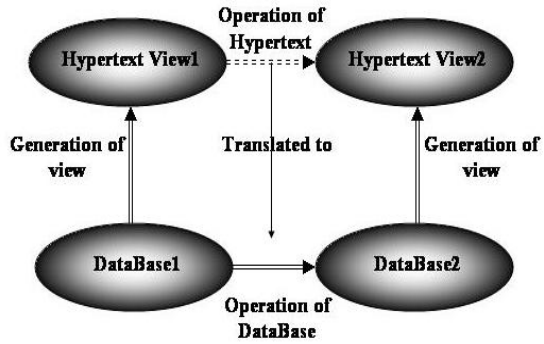

Fig. 1. View Operation

For a given view operation there are several possible translations leading to different database states that all generate the same view. It is not possible to translate view operations into database operations because of ambiguities so other auxiliary mechanism must be used.

An active link is a reference link (href) that triggers a database action when traversed. The general syntax of an active link is

active href *node_name*[*parameters*] (*standard or input or action elements*)

Link Integrity

It is useful to consider a link as the connection between two or more anchors. A link might be bi-directional. An anchor consists of the document identifier and the content reference which is some kind of a pointer to the "hotspot" or "button" or destination of the link. Sometimes anchors are held in separate link services or hyperbases as shown in figure 1b, and sometimes they are embedded within document content as shown in figure1a.

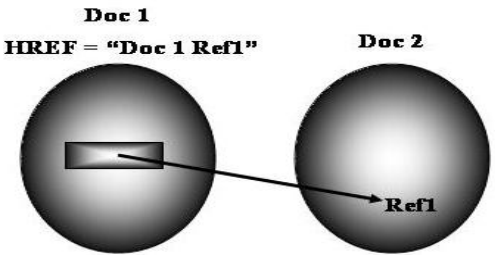

Fig 1 a : Embedded Anchor

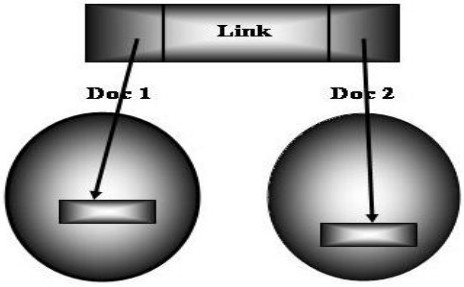

Fig 1.b.: Anchor in a Link server

There are pro's and con's to be considered for different methods of link representation[7] and different representations may require different approaches to link integrity. When a link points into a document which cannot be found then the link is called to dangle. This problem will occur whenever a document is deleted or moved without updating connected links. When an link refers to the wrong place within the document then it is a content reference problem[8]. This problem may occur if a document is changed without updating connected links. One can detect and correct broken links, one can prevent links from becoming broken in the first place or one can ignore them.

Conclusion

Access to paper documents should be done on the basis of a proper document representation. The structure introduced in this paper integrates definitions from creation models for documents and hypertext. It consists of various types of structure descriptions considering different aspects of the document. Methods for each analysis step have been proposed.

References

[1] Bernstein, M. (1998). Hypertext Gardens: Delightful Vistas. Eastgate Systems, Inc. http://www.eastgate.com/garden/.

[2] Bush V: As We May Think, Atlantic Monthly, pp. 101-108, July 1945.

[3] Leslie A. Carr, David C. De Roure, Wendy Hall, and Gary J. Hill. "The Distributed Link Service: A Tool for Publishers, Authors, and Readers" in Proceedings of the Fourth International World Wide Web Conference, Boston, MA, 647-656, [Online: http://www.staff.ecs.soton.ac.uk/lac/dls/link_service.html], December 1995.

[4] Leslie A. Carr, Wendy Hall, and David C. De Roure. "The Evolution of Hypermedia Link Services" in ACM Computing Surveys,

Symposium on Hypertext and Hypermedia, 2000.
[5] Conklin, J. (1987). Hypertext: An Introduction and Survey. IEEE Computer 20 (1987): 17-41.
[6] Conklin J.: Hypertext: An Introduction and Survey, Computer, Vol. 20, No. 9, pp. 17-41, September 1987.
[7] Hugh C. Davis. "To Embed or Not to Embed..." in Communications of the ACM (CACM), 38(8), 108-109, August 1995.
[8] Hugh C. Davis. "Referential Integrity of Links in Open Hypermedia Systems" in Proceedings of ACM Hypertext '98, Pittsburgh, PA, 207-216, June 1998.
[9] Engelbart D.C.: A Conceptual Framework for the Augmentation of Man's Intellect, in Vistas in Information Handling, Vol. 1, Spartan Books, London, 1963.
[10] Garzotto, F., Paolini P., & Schwabe, D. (1993). HDM--a model-based approach to hypertext application design. ACM Trans on Information Systems, Vol. 11, 1 26.
[11] Isakowitz, T., Stohr, A., & Balasubramanian, P. (1995). RMM: a methodology for structured hypermedia design. Communications of the ACM 38, 9), 34 -- 44.
[12] Multicosm Ltd. In Chilworth Science Park, Southampton, 1999. http://www.multicosm.com/
[13] Nanard, M., Nanard, J. (1995). Hypertext design environments and the hypertext design process. CACM, Vol. 38, No. 8.
[14] Nelson, T. (1995). The Heart of Connection: Hypermedia Unified by Transclusion. CACM, Vol. 38, No. 8, August.
[15] Nielsen J.: The Art of Navigating through Hypertext, Communications of the ACM, Vol. 33, No. 3, pp. 296-310, March 1990.
[16] R.N. Jugele and V.N. Chavan,"ODA: A Study of Document Design" International Journal of Emerging Trends & Technology in Computer Science,Vol 2,issue 1, Jan-Feb-2013,pp.194-198.
[17] Schwabe, G. Rossi and S. Barbosa. (1996). Systematic Hypermedia Design with OOHDM. Proceedings of the ACM International Conference on Hypertext (Hypertext'96), Washington.
[18] SEPIA: A cooperative hypermedia authoring environment. In Proceedings of ACM ECHT '92 Conference, ACM Press, New York, NY, 11-22. Communications of the ACM, Special section: Hypermedia Design. (1995). CACM, Vol. 38, No. 8.
[19] Shipman, F.M., Chaney, R.J., and Gorry, G.A. 1989. Distributed Hypertext for Collaborative Research: The Virtual Notebook System. In Proceedings of ACM Hypertext '89 Conference, ACM Press, New York, NY, 129-135.
[20] Shneiderman B., Kearsley G.: Hypertext Hands-on: An Introduction to a New Way of Organizing and Accessing Information, Addison-Wesley, Reading, MA, 1989.
[21] Smith J.B., Weiss S.F.: Hypertext, Communications of the ACM, Vol. 31, No. 7, pp. 816-819, July 1988.
[22] Streitz, N., Haake, J., Hannemann, J., Lemke, A., Schuler, W., Schutt, H., and Thüring, M. 1992.

Books

[1] Principles of Multimedia
By. Ranjan Parekh
Tata McGraw Hill Companies.
[2] Hypertext and Hypermedia.
By. J. Nielsen
Academic Press.
[3] Data Base System Concepts
By, A Silbers Chatz, Henry Korth and S. Sudarshan
Mcgraw-Hill Ltd. 3rd edition.